BAYE'S THEOREM – i) Conditional Probability ii) Independent event iii) Dependent events

Independent events → When the two events are independent of each other, they are known as independevent event.
For example – Tossing of a coin. $P = 0.5$

Dependent events → Suppose in a bag of marbles we have 5 marbles. (3 Red, 2 Black)
3R, 2B

$\boxed{RRR\ BB} \xrightarrow{1\ Black} \frac{2}{5}\ \text{(probability)} \xrightarrow{1\ Black} \frac{1}{4}\ \text{(probability)}$

Here in dependent events, probability keep changing but in case of Independent events probability is constant.

Conditional probability → $\boxed{P(A|B) = \frac{P(A \cap B)}{P(B)}}$ A → Event 1   B → Event 2.

This mean we have to find the probability (A) given p(B) is already happen.

It is also a type of Dependent ~~eveab~~ events.

Bag (3 Red, 2 Black) → Event 1 → ~~P(B)~~ $= \frac{2}{5}$ → Event 2 → $P(B|A)$ ~~P(A|B)~~ → $\frac{1}{4}$
3R, 2B   Taking out 1 B   P(A)   Taking out 1 Black again   Probability of black given that we took black at first

$P(A) = 2/5$, $P(B|A) = 1/4$

$P(A \cap B) = P(B|A) * P(A) = 2/5 \times \frac{1}{4} = 1/10$

P (A and B both event taking place).

$P(B|A) = \frac{P(A \cap B)}{P(B)} = \frac{1/10}{2/5} = 1/4$, so by this formula we can find probability of an event given that an event already happened.

Baye's theorem → $P(A|B) = \frac{P(A \cap B)}{P(B)}$ or $P(B|A) = \frac{P(B \cap A)}{P(A)}$.

$P(A \cap B) = P(A|B) * P(B)$ $P(B \cap A) = P(B|A) * P(A)$

$P(A|B) * P(B) = P(B|A) * P(A)$ → Likelihood of probability

This is the baye's theorem example,

$$P(A|B) = \frac{P(B|A) * P(A)}{P(B)}$$

P(A) → prior probability
P(A|B) → posterior probability.
P(B) → Marginal probability

Example of Baye's theorem, Example
Outlook → sunny, overcast, ~~rainy~~. Temperature → hot, mild, cold , play → yes, No.
Find the probability today we will play or not?

Today → Sunny, hot $P(yes|today) = \frac{[P(Sunny|Yes) * P(hot|yes)] * P(yes)}{P(Today)}$

Naive meaning shows a lack of experience judegement.
Naive Baye's is naive because it makes the assumption that features of a measurement are independent of each other. This is naive because it is (almost) never true.